

WHAT WE CLAIM IS:

1. An image carrier used in an image forming apparatus comprising a dielectric layer, wherein charge is transferred between said dielectric layer and a charge-transfer controlling means so as to apply charge to or remove charge from said dielectric layer, wherein

said dielectric layer has a low-resistance layer formed on the outer surface thereof, said low-resistance layer comprises a large number of conductive portions, charge is transferred between said conductive portions and said charge-transfer controlling means so as to apply charge to or remove charge from said conductive portions, and said conductive portions are arranged to be dispersed separately from each other.

2. An image carrier used in an image forming apparatus as claimed in claim 1, wherein said conductive portions are a large number of dots which are dispersedly arranged.

3. An image carrier used in an image forming apparatus as claimed in claim 1 or 2, wherein said large number of conductive portions are at least partially exposed on the surface of said low-resistance layer.

4. An image carrier used in an image forming apparatus as claimed in any one of claims 1 through 3, wherein

the electric resistance of said low-resistance layer is anisotropic in such a manner as to satisfy

"resistance in a direction perpendicular to the plane direction of said low-resistance layer (i.e. in vertical direction) < resistance in the plane direction of said low-resistance layer (i.e. in lateral direction)".

5. An image carrier used in an image forming apparatus as claimed in any one of claims 1 through 4, wherein the thickness of said

low-resistance layer is set to be 1 μm or less.

6. A method of manufacturing an image carrier as claimed in any one of claims 1 through 5, comprising:

a step of previously forming a large number of concavities in the outer surface of said dielectric layer so that said concavities are dispersed separately from each other,

a step of coating conductive material onto the surface of said dielectric layer formed with said concavities, and

a step of grinding at least said coated conductive material, thereby forming the large number of conductive portions which are separately dispersed.

7. A method of manufacturing an image carrier as claimed in any one of claims 1 through 5, comprising:

a step of making said dielectric layer from an insulating material which is soluble relative to a predetermined liquid, and

a step of spraying a liquid, prepared by dispersing conductive particles dispersed into said predetermined liquid, onto predetermined positions of the surface of said dielectric layer at predetermined intervals, thereby forming said conductive portions.

8. An image forming apparatus comprising at least: an image carrier on which an electrostatic latent image is formed and a writing device for writing said electrostatic latent image on said image carrier, wherein said electrostatic latent image is written on said image carrier by said writing device, wherein

said writing device has writing electrodes for writing said electrostatic latent image on said image carrier, said image carrier has a

charge injection layer, the electric resistance of said charge injection layer is anisotropic in such a manner as to satisfy "resistance in a direction perpendicular to the plane direction of said charge injection layer (i.e. in vertical direction) < resistance in the plane direction of said charge injection layer (i.e. in lateral direction)", said writing electrodes are in contact with said charge injection layer, whereby said electrostatic latent image is written dominantly by charge injection between said writing electrodes and said charge injection layer.

9. An image forming apparatus as claimed in claim 8, wherein the thickness of said charge injection layer is set to be 1 μm or less.

10. An image forming apparatus as claimed in claim 8 or 9, wherein said charge injection layer is provided with a large number of charge injection portions to which charge injection is conducted by said writing electrodes, and said charge injection portions are arranged to be dispersed separately from each other.

11. An image forming apparatus as claimed in claim 10, wherein said charge injection layer has a large number of concavities which are formed to be dispersed separately from each other, and said charge injection portions are formed in said large number of concavities.

12. An image forming apparatus as claimed in claim 10 or 11, wherein the area of a surface of said each charge injection portion to be in contact with said writing electrode is set to be smaller than the contact area of said each writing electrode relative to said charge injection layer.

13. An image forming apparatus as claimed in any one of claims 10 through 12, wherein said writing electrodes are arranged in contact with said image carrier at constant positions relative to the axial direction of

said image carrier.

14. An image forming apparatus as claimed in any one of claims 8 through 13, wherein the average sectional area of toner particles for developing an electrostatic latent image written on said image carrier is set to be smaller than the contact area of said each writing electrode relative to said charge injection layer.

15. An image forming apparatus as claimed in any one of claims 8 through 14, wherein said charge injection layer includes conductive particles and the contact area of said each writing electrode relative to said charge injection layer is set to be larger than the sectional area of said each conductive particle.

16. An image forming apparatus as claimed in any one of claims 8 through 14, wherein said charge injection layer includes conductive particles, the contact area of said each writing electrode relative to said charge injection layer is set to be smaller than the sectional area of said each conductive particle, and the maximum dimension of the section of said each conductive particle is set to be smaller than the distance between adjacent writing electrodes.

17. An image forming apparatus comprising at least: an image carrier on which an electrostatic latent image is formed and a writing device for writing said electrostatic latent image on said image carrier, wherein said electrostatic latent image is written on said image carrier by said writing device, wherein

said writing device has writing electrodes for writing said electrostatic latent image on said image carrier and a flexible substrate for supporting said writing electrodes,

said image carrier has a conductive substrate to which a low voltage, based on the absolute value, is supplied, and said image carrier is provided with a multi-layer structure composed of a dielectric layer formed on said conductive substrate and a low-resistance layer, i.e. a charge injection layer, formed on said dielectric layer,

said writing electrodes are in contact with said charge injection layer, whereby said electrostatic latent image is written dominantly by charge injection between said writing electrodes and said charge injection layer.

18. An image forming apparatus as claimed in claim 17, wherein the surface resistance of said charge injection layer is set to satisfy "electric resistance in the vertical direction < electric resistance in the lateral direction",

19. An image forming apparatus as claimed in claim 17 or 18, wherein the thickness of said charge injection layer is set to be 1 μm or less.

20. An image forming apparatus as claimed in any one of claims 17 through 19, wherein said charge injection layer is formed in an islands-in-sea structure in which a large number of charge injection portions are formed in the outer surface of said dielectric layer and are dispersed separately from each other.

21. An image forming apparatus which forms an electrostatic latent image on an image carrier by using a writing device comprising a plurality of writing electrodes which are arranged in contact with said image carrier along a direction parallel to the axial direction of said image carrier, wherein

said image carrier comprises a dielectric layer formed on a conductive substrate and a charge injection layer formed on said dielectric layer, and is set to satisfy

$$d_1^2 < \text{unit area of electrode}$$

wherein d_1 is the thickness of said charge injection layer.

22. An image forming apparatus which forms an electrostatic latent image on an image carrier by using a writing device comprising a plurality of writing electrodes which are arranged in contact with said image carrier along a direction parallel to the axial direction of said image carrier, wherein

said image carrier comprises a dielectric layer formed on a conductive substrate and a charge injection layer formed on said dielectric layer, and is set to satisfy the following relation:

$$d_1^2 < \rho_s / \rho_v$$

wherein d_1 is the thickness of said charge injection layer, ρ_v is the volume resistivity in the depth direction of said charge injection layer, and ρ_s is the volume resistivity in the surface direction of said charge injection layer.

23. An image forming apparatus as claimed in claim 22, wherein $\rho_s > \rho_v$ is satisfied.

24. An image forming apparatus which forms an electrostatic latent image on an image carrier by using a writing device comprising a plurality of writing electrodes which are arranged in contact with said image carrier along a direction parallel to the axial direction of said image carrier, wherein

said image carrier comprises a dielectric layer formed on a conductive substrate and a charge injection layer formed on said dielectric

layer, and is set to satisfy the following relation in case of reproducing gradation by using a stripe gray-reproducing pattern:

$$(d_2 / (\rho d_1 \epsilon)) (1 - 4 d_1^2 / l_1^2) > |V_{on} - V_{off}| / (|V| \Delta t)$$

wherein V is voltage applied to the electrodes, V_{on} is injected potential, V_{off} is potential between lines, d^1 is thickness of said charge injection layer, d_2 is the thickness of said dielectric layer, ρ is the volume resistivity of said charge injection layer, ϵ is the dielectric constant of said dielectric layer, and Δt is the writing time.

25. An image forming apparatus which forms an electrostatic latent image on an image carrier by using a writing device comprising a plurality of writing electrodes which are arranged in contact with said image carrier along a direction parallel to the axial direction of said image carrier, wherein

said image carrier comprises a dielectric layer formed on a conductive substrate and a charge injection layer formed on said dielectric layer, and is set to satisfy the following relation in case of reproducing gradation by using a dot gray-reproducing pattern:

$$d_2 / (\epsilon \rho d_1) \times (1 - 2 d_1^2 / (l_1^2 (1 + 2 r_0 / l_1) l_n (1 + l_1 / r_0))) > |V_{on} - V_{off}| / (|V| \Delta t)$$

wherein V is voltage applied to the electrodes, V_{on} is injected potential, V_{off} is potential between dots, d^1 is thickness of said charge injection layer, d_2 is the thickness of said dielectric layer, ρ is the volume resistivity of said charge injection layer, ϵ is the dielectric constant of said dielectric layer, Δt is the writing time, and l_1 is the distance between dots.

26. An image forming apparatus which forms an electrostatic latent image on an image carrier by using a writing device comprising a plurality

of writing electrodes which are arranged in contact with said image carrier along a direction parallel to the axial direction of said image carrier, wherein

said image carrier comprises a dielectric layer formed on a conductive substrate and a charge injection layer formed on said dielectric layer, and said charge injection layer is made of a binder and conductive aggregate dispersed in the binder, wherein said each conductive aggregate is set to be smaller than the distance between electrodes and the distance between conductive aggregates is set to be smaller than the width of each electrode.

27. An image forming apparatus as claimed in claim 26, wherein said charge injection layer is made by mixing titanium dioxide treated to have conductivity and polyamide resin by using ethanol as a solvent.